Websites construction as learning tools.

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1. INTRODUCTION

How to teach pre-service teachers about information technology and how to encourage them to integrate information technology into the classroom are persistent questions for educators. Information technology has the potential for students to learn in ways that would be difficult if not impossible with standard modes of pedagogy. That said, if teachers are to integrate technology into the curriculum, it is likely that they will need to gain experience with the technology in meaningful, integrative ways early in their career, preferably beginning with their teacher education. However, given pre-service teachers' lack of experience and tendency to be technology phobic, how feasible is it to teach pre-service teachers in ways that help them think more deeply about the possibilities for integrating information technology in the classroom?

This paper is about the use of websites for learning in teacher education. It describes our attempt to help pre-service elementary and primary teachers to think about creative ways of integrating technology in the classroom by involving them in website construction for their own learning about teaching. (Websites and their construction are examples of the general issue of technology integration.) In addition to learning technology skills, the process of website construction was a way of learning educational content rather than simply a means for conveying information. In the next part of the paper we set the context by describing an educational technology course that allowed us to work with pre-service students on IT integration. We then outline the idea of a coherent website—the vehicle for working with pre-service students on IT integration. One of the student-group websites is examined with respect to the process, structure, and content of a coherent website, and ways in which this contributed to their learning about teaching as well as learning to think about possibilities for IT integration is discussed. In the final section we review the successes and the challenges and the potential of websites for learning.

2. COURSE DESCRIPTION

The course involving website construction was taught in the Primary Education Department of the International University of Catalunya, Spain. To become a primary school teacher in Spain, students must take a three year degree in a teacher education program at a university. Each program consists of approximately 220 credits, varying slightly in different universities.[1] On average the courses in a program consist of 4.5 credits (10 class hours per credit). There are six different specializations: Special Education, Music, Physical Education, Primary teacher, ESL, and Kindergarten. The practicum is normally 32 credits. Universities distribute the practicum equally among the 3 years. All courses are taken in the department of education of the university, and after the program students are certified to step into a classroom.

An introductory educational technology course is required during the very first year of the pre-service program. This means that the pre-service students in the course are very young—in fact, they are just out of high school—and they have little life experience and no experience of thinking about issues of education, other than their own

student experiences. Most of the students learning to be primary school teachers in Spain are women and, generally speaking, they tend to be technology shy.[2]

Given that we were teaching a standard educational technology course, we naturally wanted these pre-service students to be introduced to various information technology applications and to learn some of the skills for their use. But we wanted to try to go beyond traditional skill approaches by getting pre-service students to think about technology in ways that might plant the seeds for a deeper conception of technology integration when they became teachers. We realized that our task would be difficult because of students' lack of theoretical and practical experience. For instance, because they were just beginning their program, they did not understand (let alone have experience with) the most elemental concepts concerning unit design, objectives, activities, and evaluation. Nevertheless, in spite of these hurdles, we were curious to see how far we could go with the idea of organic integration.

The vehicle for encouraging pre-service students to "think" in more integrative ways was the construction of websites. Rather than to have pre-service students learn about websites that are slick, professionally finished products, we wanted them to engage in the actual construction of websites and to think of the potential of *website construction* as a means for learning. The means for doing this was to have them construct websites in which the substance of the website would push them to think about things they would have to deal with when they became teachers: units, objectives, activities, evaluation, and so on. Our eyes are on their future in the classroom, of course, but in our educational technology course we wanted to engage their thinking about *teaching* through the use of website construction. We wanted educational issues to be in the foreground, rather than technology. We anticipated that with a little direction they could learn technological skills and would grow in their confidence with experimenting to learn. The type of website construction we had in mind emphasized collaboration and connection. We have called these coherent websites:

3. COHERENT WEBSITES

Two ways of thinking about school websites are helpful for articulating our position: standard websites and coherent websites. Standard school websites emphasize the product. They are professionally done for the purposes of providing information, and they are used in schools from kindergarten to graduate school. The nature of the information may vary but normally school websites contain information about the overall orientation of the school, the curriculum, the physical facilities, the faculty, samples of school projects (in the case of elementary schools) and so on. Such information is invaluable for helping parents make choices about schools for their children and for young adults to make choices about what university to attend, for instance, and may be the starting point for researching alternative possibilities.

Coherent websites incorporate a different vision of the potential of technology. Coherent school websites are different from standard websites in that they emphasize the process of website construction.[3] Furthermore, the content of a coherent website is meant to go beyond simply providing information. The overall aim of a coherent website is to contribute to the development of a collaborative learning community that emphasizes the connections among knowledge and skills in a school. A coherent website is not the product of a professional. It is constructed by students and teachers and its primary function is to engage them in learning that stresses connections in a curriculum. The idea of a coherent website is in its infancy, but we think that it has the potential for fostering the integration of technology and classrooms. Such a vision may well be in the distant future, but if we begin with pre-service education there is the possibility of providing images and ideas to pre-service teachers that might bear fruit later in their teaching. One way of doing that is to involve pre-service teachers in the construction of coherent websites as part of their own learning. As we see it, there are at least three very general characteristics of a coherent website: process, content, and structure:

· Process: The eventual aim is for teachers to work with each other and with their students to construct connected websites which help students collaboratively learn significant concepts. Our immediate aim is to assist pre-service teachers to work with each other. The emphasis is on a collaborative learning process of constructing websites and linking them together. Although technical issues are anticipated, the central focus of the process is always on, "what educational goal (s) will this website support?" In short, the process among the pre-service teachers is to be collaborative and focused on educational goals rather than technology.

· Content: A coherent website should actively engage students (in our case, pre-service teachers) in learning significant educational goals—in our case, pre-service teachers use website construction to

learn about curriculum they would one day teach. As with any website, a coherent website contains various kinds of information, but the idea is that the information should go beyond simply listing facts as is often the case with standard websites. As will be seen below, the content our pre-service teachers focus on is a topic that they will eventually teach and the activities and evaluation that would fit that topic. The content needs to involve students and teachers in common tasks and activities that have educational merit beyond the use of technology for its own sake.

· Structure: a coherent website is several websites that are linked according to meaningful content and are accessed through a "home" site. Visually, a coherent website is a spider-web in which each intersection is a website with the "school" website at the center. As with more sophisticated commercial websites, a coherent website must allow a user to move from one linked website to another within the "web".

These were the characteristics of the websites we were aiming for with a class of pre-service teachers. The concept of coherent websites was shaped by our understanding of the organic nature of information technology, including the Internet and associated technologies, and our work with a group of pre-service teachers (Álvarez and Kilbourn, 2003). There, the emphasis was on developing the concept of coherent websites and using our experiences with a handful of students to stimulate our thinking. But we knew that if the concept of coherent website had legs it would have to run in a more realistic teaching/learning situation. Such a situation presented itself in the spring of 2003 with a class of 48 pre-service teachers.

Typical of most courses in the program, this course met for two hours twice a week for 10 weeks. Forty-eight pre-service students worked in 12 different groups and each group of four constructed a coherent website. To give their activities a degree of structure, we said that the coherent website constructed by each group should contain four "sub-websites" according to (a) Introduction, (b) Topic, (c) Activities, and (d) Evaluation (ITAE). Again, it is important to remember that the emphasis was on the process of constructing these 12 coherent websites, including the collaborative learning about educational issues that the task encouraged. While it is fair to say that the coherent websites looked amateurish in comparison with standard, polished, professional websites, it is also important to remember that these pre-service students had very little experience either with technology or education; in spite of that, they got involved in actually constructing websites from scratch and took time to discuss the sorts of educational goals that their work would support. The process can be outlined in the following way:

After introducing students to the Yahoo website maker and making sure that they had access to the program at home and at the university, we worked with them in practice sessions to become familiar with the rudiments of that easy-to-use program. They alternately worked in their groups of four to discuss a topic of study, meeting as a whole class to talk about their progress and what was going on.

The topics had to come from the published K-8 curriculum guides. This was an important part of the process because it meant that they were immediately immersed in educational issues and the technological skills were put into the background. Each group was given choice and encouraged not to duplicate each other's topic to insure as wide a range of topics as possible. These are the topics pre-service students came up with: Body Parts, Colors, Craftsmen, Provinces, Farm Animals, Fruit, Letters, Marine Animals, My City, Numbers, Squares, Work. Each group worked on a single topic rather than several topics primarily because of the short length of the course and it was pedagogically expedient in the large-group discussions to identify each group with a single topic.

Each group having a single topic as a backbone from which to work was important because it began the process of imagining a topic they would one day teach; it also began the process of thinking about what activities would support the chosen topic, and how those activities could be evaluated. After going over the curriculum guides, each group selected a topic and used Yahoo's website maker to locate the topic as a website. The minimum guideline was that after naming the topic they had to write down the goals they wanted to accomplish. Once they were finished, they worked on the construction of another website that listed possible activities for the topic. Finally, they constructed a third website which gave guidelines for evaluation of the activities. When these four websites were linked, they constituted the group's coherent website—it was coherent in the sense that the individual websites were technically and conceptually linked.

As might be imagined, given the minimal guidelines to the construction of the websites, each group's coherent website was unique and its structure and content varied considerably in relation to the other groups. When all groups had finished a particular website (either introduction, topic, activities, or evaluation) another large-group

meeting was held to explain what had happened. Each group gave a brief sketch of what they did. They talked about educational issues that emerged concerning ITAE. They also highlighted technical issues concerning transitions, pictures, font size, font color, and so on.

At this point in the process there were 12 different coherent websites, each constructed by one of the 12 groups and each containing four sub-websites (ITAE). The next big step in the process was to increase the coherence by linking all 12 websites into a "coherent school website". The reason for doing this was twofold: In the short term, we wanted students to use the technology to connect with what each group had done and, we wanted them to keep genuine educational issues in the foreground. In the long term, we wanted them to see how the technology potentially could be used to create a school community in which teachers (and students) would be able to see how various concepts were linked and dealt with at each grade level in the school. Obviously, the work of these pre-service teachers was only a beginning on that rather ambitious agenda, but nevertheless it was consistent with the aim of using technology in integrative ways.

The means for linking the 12 websites was another technological medium—email. During the course, each group had its own email address. At a large group meeting it was agreed that each group would email their website address to the other 11 groups to be included in the Introduction portion of their own coherent website. This meant that anyone could connect with the work of the other groups. Fig.1 shows the Introduction (the title of the introduction and the names and pictures of the individuals of the group have been edited out to maintain anonymity) of a group's website on fruit. At the top of Fig.1 are the other sites (topics, activities, evaluation) of this website. Below that is "LINKS a altres pàgines de la nostra escola" (Links to other pages in our school). As can be seen in the figure, each of the other websites is linked according to its ITAE.

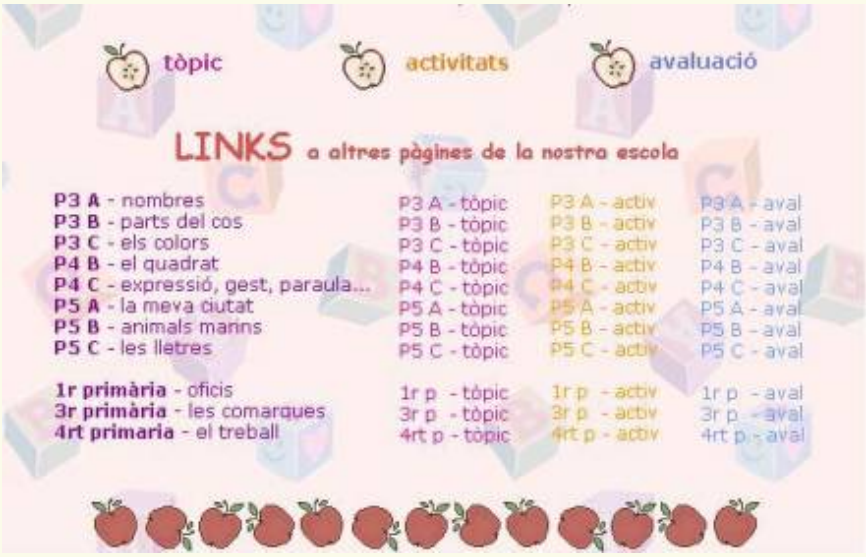

Fig. 1. Introduction to Fruit

The group websites were now able to connect with each other. For instance, the group working on the topic "Fruit" (Fig. 1) could log onto other groups' topics, activities, and evaluation without having to log off from their own website.

4. STUDENTS' WORK: PROCESS, CONTENT AND STRUCTURE

It is instructive to look at Figure 1 in terms of the three characteristics of coherent websites we mentioned above (process, content, structure). With respect to process, we want to highlight that the development of this site (Introduction to Fruit), as with the other sites, was a team effort. Each group worked together to construct their four websites into a coherent group website. At the end of the entire process they went back to their introduction and integrated the website addresses sent over email from the other groups. After the groups constructed each sub-website (ITAE) there would be a whole class discussion in which they presented what they had done and talked about what worked well and what did not, including technical snags they ran into. It was during these large group meetings that the groups got ideas from others about what they might do with their own websites.

The content of a coherent website is intended to go beyond merely providing information by involving the student in significant educational issues. In the case of our pre-service students, the content of their coherent

websites was related to the K-8 curriculum. As can be seen in Figure 1, the introductions running along the left-hand column each have a corresponding topic, activities, and evaluation component which have been partly drawn from the curriculum that they will eventually have to teach. The curriculum content of each of the websites represented a serious challenge for them. Questions concerning how to frame objectives, select activities, and evaluate student progress were the focus of group discussions and symbolized in the websites themselves. Although students experimented with such technical issues as color, font size, and graphics, the core of their work centered on educational goals rather than technical ones.

With respect to structure, it is helpful to look at Levels 1 and 2 of Figure 2. These two levels represent what we are calling coherent websites. They are coherent in two senses: First, each sub-site (box) is related to the other sub-sites by virtue of addressing a topic drawn from the curriculum guides. Second, within each sub-site one can access any of the other sub-sites. Although it is cumbersome to represent in a figure, an entire picture of the coherent website of the school would include 12 ITAE sub-sites (12 introduction sub-sites, 12 topic sub-sites, 12 activity sub-sites, and 12 evaluation sub-sites), for a total of 48 sub-sites. Each of the 12 groups began by constructing websites at Level 2. When all groups had finished, they linked their groups sites to construct Level 1, the coherent school website.

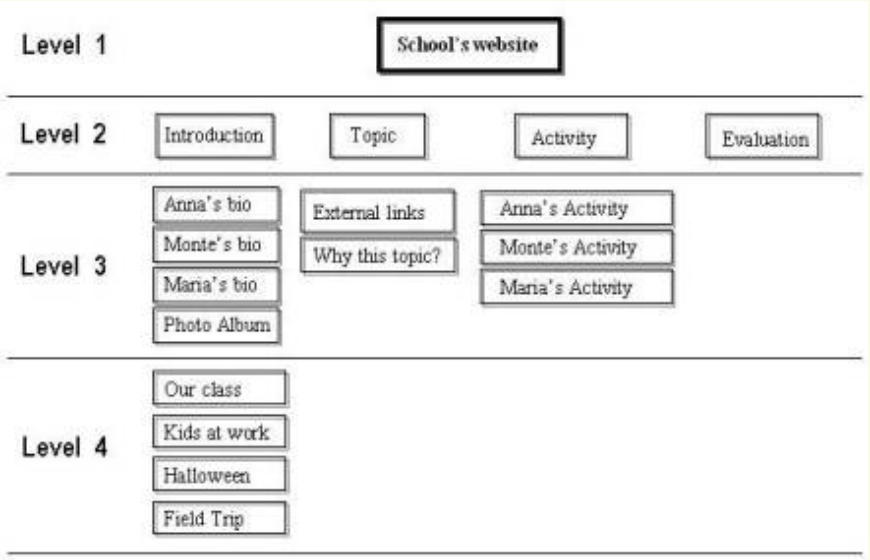

Fig. 2. Multilevel Coherent Website Structure

5. SUCCESSES AND CHALLENGES

A number of issues arose as a result of our attempt to get pre-service teachers to start thinking about technology in more integrative ways by involving them in the construction of coherent websites. Here we would like to enumerate some of the more significant issues, particularly with respect to what seemed to go well and what did not concerning ITAE and technology, respectively. We will take the issues about ITAE first.

Not surprisingly, given their lack of experience, these pre-service teachers found dealing with issues about curriculum, teaching, and learning to be very difficult. The selection of topics and subsequent articulation of objectives and appropriate activities, let alone evaluation, proved to be a serious stumbling block. Although the use of curriculum guides was helpful and realistic (insofar as that would be what they would have to do as teachers), the guides themselves are very general. For instance, there are three grade levels for kindergarten, but the curriculum guides address general goals for all three levels rather than specifying activities appropriate for each level. The creation of activities appropriate to a 5 year old, but not suitable for a 3 year old was, generally speaking, beyond their initial capability.

Another type of problem emerged when one group decided to add more websites to their own structure. The group explained that they had taken computer courses when they were in high school and that helped them for this course. They were keen to continue making more sub-websites—they were quicker at the tasks than the other groups and wanted to move beyond where most people had finished. Their work is represented in Levels 3 and 4 of Fig. 2. What is important to note is that the sites they created were not technically linked to Levels 1 and 2 and they had little educational content. The sites at Level 4 had almost nothing to do with their chosen topic. Their student activities in Level 3 (Anna, Montse, and Maria) were linked to activities at level 2 but were not linked

with each other. In other words, left to their own devices this group shifted to a more standard website production and quickly forgot about issues of coherence and connection. In Level 3 it can be seen that under "Topic" (Level 2) the group created the sub-webpages "External links" and "Why this topic?" The creation of these two sites was as a result of discussions with the professor, rather than on their own. The suggestion was made that they talk about why they were creating the sites that they had created and that they discuss possible linkages to the web. It was only after those discussions and suggestions that they included these two sites.

However, the picture with respect to ITAE was far from dismal. On the bright side, these very young students immersed themselves in conversations about teaching and learning that, good or bad, were very much anchored in serious educational questions rather than the bells and whistles of the technology they were using to capture those discussions. Also, unlike the generally abstract theory courses that are common in their pre-service curriculum, their attempt to visualize a virtual school, captured by the idea of a coherent school website, and their use of the curriculum guides got them closer to practical classroom issues earlier in their program than might have otherwise happened. In fact, the very form of the basic coherent website construction (sub-sites made up of ITAE) reinforced important distinctions that a primary teacher must deal with on a daily basis.

With regard to the technology per se—that is, the actual construction of websites—all of the groups were able to construct coherent websites with no more difficulty than might be expected of someone learning a program for the first time. As we overheard their group conversations, we came to the conclusion that, because most of their experience with technology was limited to entertainment (VCR's, cell phones, computer games, etc.), it came as a bit of a shock that they would have to use technology to do work—it seemed to be an idea they had never really considered before. One clear pedagogical issue became apparent toward the end of the course. We had taken a step by step approach to the actual construction of coherent websites, but, although we talked about the general aim and shape of a coherent website, we never actually showed them, structurally, what one might look like. Several students commented at the end of the course, that they thought it would have been easier if they had had an image of what the end result might look like. This was an oversight on our part, but one that will be easily rectified. Finally with regard to technology, a number of students commented on how exciting it was that they had started out computer illiterate and petrified of touching a keyboard and they had ended up having constructed an actual website. It became clear that most of them (not all) understood the difference between a coherent website and a standard school website. As one student remarked, "most school websites are propaganda for parents, [whereas] coherent websites are for students to do work."

6. CONCLUSION

There were several general issues that emerged during the course and that serve as a backdrop to the more specific concerns about technology integration and coherent websites. To start with a very positive point, it is important to comment on the nature and conduct of the groups. Although there is ample pedagogical justification for group work, we confess that the use of groups in this context was primarily of necessity. Plainly put, there were not enough computers to go around. Initially seen as a liability, this turned out to be an asset to learning. Within each group of four students it was usual that one or two of them would have more experience with computers than the others and these students naturally helped their peers. The mutual support and collaboration was noticeable during group work. (Individuals were rotated at the computers so that those with more experience would not dominate.)

At the end of the course, a formal, taped interview was conducted with one of the groups concerning their experiences. They commented that at the beginning of the course they felt "terror and panic" at the thought that they would have to actually construct a website; they pointed out that working in groups helped them overcome their fear because as each one took a turn at the computer her/his partners would be supportive by making suggestions and giving encouragement. They also pointed out that the fact that after the coherent school website (level 1 in Fig.2) was constructed, they were able to look at each other's work, and they could get a good sense of the relative sophistication of the websites, even though everyone had followed the ITAE format. By comparing different websites, they began to see how some were technically better than others and they acquired ideas about how to make their own sites more coherent and comprehensible.

Although the interview with this group of four students was revealing and did help us make sense of their experience, we were taken aback at their reticence to talk. There are undoubtedly many reasons why this was the case, but we could not help but think that one of those reasons is that these students have spent their entire schooling in situations where the central model of teaching is to assimilate the information that teachers give them. Typically, they have not be asked to reflect on and talk about their learning and the pedagogical approach

that a teacher used. Consequently, when they are asked what went well, what didn't go well, what they liked, what they didn't like, and what changes they would suggest for future pre-service students in this educational technology course, they are at a loss for words. We suspect that no one has asked them this before. This is a cultural feature of schooling in Catalunya (if not the rest of the world!) and we are under no illusions that it can be turned around in a single course. Nevertheless, we do believe that there are things we can do to help them reflect and talk about their learning experiences so that we can more readily reflect on what seems to be working and what is not.[4]

Another general issue is simply a fact of life for any non-English speaking country that is using technology dominated by English. The university where this course was taught is an international university which means that the faculty and students should be able to communicate in Catalan and English. At present, this is more an ideal than a reality. The fact that most of the computer commands for constructing a website were in English was yet another hurdle for many of the students. They were given translation sheets which helped them overcome this hurdle, but there is little question that their progress was slowed because of the language issue.

The overwhelming issue that shaped the course from the very beginning was the lack of experience of these students. It bears repeating that most of them were just out of high-school and this was one of the first courses of their program. We fantasize that it should come at the end of their program rather than at the beginning, but that is an unlikely scenario and we recognize that this is a standard pre-service dilemma. As it stands, we are pleased (but not content) with our attempt to work with pre-service students in ways that go beyond teaching technology merely as skill; we are pleased enough with our efforts that we will try to improve working with their inexperience in ways that incorporate the educational issues that they will eventually have to address in their own classrooms.

7. REFERENCES

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8. NOTES

[1] As with other European countries, requirements of the program are currently under revision to conform to EU standards.

[2] With every passing year more have had at least some experience with computers and, similar to other European youths.

[3] Coherence is a central concept in an organic way of viewing the world which emphasizes integration and connection. *Coherent website* is the name we have used to stress the organic quality of websites we are describing and advocating as a learning tool (Álvarez and Kilbourn, 2003).

[4] In the future we will be using the Knowledge Forum (Scardamalia and Bereiter, 2003) as a vehicle for students to systematically and periodically document their reflections on their own learning experiences.

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